
Senegalese Experience in the Surgical Management of Pott's Disease in Children and Adolescents: Diagnostic, Therapeutic and Prognostic Aspects of 53 Cases

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Abstract: Spondylodiscitis is an infection of the intervertebral disc and the adjacent vertebral bodies. The particularity of this pathology in children is that it is often a primary infection. The objective of this work is to evaluate and determine the frequency of surgical management of pott's sore in children and adolescents in neurosurgical services in Senegal. We retrospectively studied 53 files from 6 neurosurgical centers in Senegal, during a period of 6 years and 6 months i.e. from January 2015 to July 2021, Pott's disease in children and adolescents accounted for about 53/212 cases operated on in Senegal, i.e. 25% of this surgery in Senegal and 17% of tuberculous spondylodiscitis in Senegal. The Dakar centers were the most frequent site with 46.36%. The sex ratio was 3.8. The average age was 17 years; tuberculosis infection was found in 26% of cases. Neurological disorders were observed in 64.15% and 35.85% of patients were FRANKEL E. The spinal CT scan was the diagnostic tool in 98.28% and the dorsal segment was the most affected, i.e. 46.08%. Surgery was performed in 100% of cases. Laminectomy + osteosynthesis accounted for 71.69% of cases (n=38). Motor recovery was observed in 83% of cases for a follow-up period of 3 to 12 months in our series, i.e. 44 patients. The surgical management of tuberculous spondylodiscitis in children and adolescents is a rare and under-explored entity. The diagnosis is both clinical and paraclinical, the medical treatment always keeps its place even if some cases required surgery, the functional prognosis is in general good, often associated with functional rehabilitation.

Keywords: Spondylodiscitis, Surgery, Child and Adolescent, Senegal

1. Introduction

Spondylodiscitis is the infection of an intervertebral disc and the adjacent vertebral bodies. According to the WHO, the percentage of tuberculosis in children varies from 3% to over 25% depending on the country. In Sub-Saharan Africa, the frequency of all forms of tuberculosis is estimated to be around 11% of cases [3]. The particularities in children are that it is often a primary infection, the intervertebral discs are vascularised, and the infection can be localized at this level, thus creating a discitis before constituting the spondylitis, the spinal deformation remains the reason for consultation. The child's

spine is unstable because it is still growing, which is why it is important to use a support corset that will be updated according to its evolution [4]. The object is to evaluate and determine the frequency of surgical and adolescent management of pott's headache in neurosurgical services in Senegal.

2. Materials and Methods

During a period from January 2015 to July 2021, i.e. 6 years and 6 months, we conducted a retrospective, descriptive, multicenter study in the neurosurgery departments of Senegal, 4 of which were located in the capital (Fann University Hospital, Idrissa Pouye General

Hospital, Dakar Main Hospital) and 3 in the regions (Thiès Regional Hospital, Ziguinchor Regional Hospital, and Ziguinchor Peace Hospital). This study concerned patients who were operated on and followed up for tuberculous spondylodiscitis during our study period.

During this study, we focused on the data concerning the presumptive diagnosis of pott's disease by studying the clinical signs of tuberculosis impregnation, the biological signs of tuberculin reactions, and the existence of a biological infectious work-up and the radiological signs of bone destruction without construction. Therapeutically, surgical management according to an operative protocol indicated for pott's disease (surgical approach of the spine and/or associated extra spinal tubercular foci) and the association with an anti-tuberculosis treatment for medical management. In terms of evolution: Follow-up of the medical treatment is between 6 and 12 months. And for the diagnosis of certainty: the detection of caseum or tubercular follicles in the anatomopathological examination of the samples.

The data were collected from hospital registers, records, and operating protocols of patients hospitalised for tuberculous spondylodiscitis. For each patient, a survey form was drawn up including age, sex, geographic origin, history, consultation time, clinical examination, biological and radiological check-up, anatomical pathology examination, and surgical treatment. And the evolution of the patient. The word processing was done with Microsoft Word 2010, the data analysis with Epi Info Version 7.2, and e diagrams and tables with Microsoft Office Excel 2013.

3. Results

3.1. Descriptive Epidemiology

- 1) Pott's disease in children and adolescents accounted for about 53/212 cases operated on in Senegal, i.e. 25% of this surgery in Senegal and 17% of tuberculous spondylodiscitis in Senegal.
- 2) The region of Dakar and its suburbs represented 46.36% of the cases (n=24) in our series, i.e., 8 patients in the region of Thiès, patients in the region of Kaolack, 3 patients in Ziguinchor, 2 patients in Saint Louis, 2 patients in Kolda, 1 patient in Matam and that in 7 patients had an undetermined address;
- 3) A clear male predominance was found, i.e. 42 patients (79% of cases) against 20.75% of female cases, i.e. 11 patients with an estimated sex ratio of 3.8.
- 4) The 16-24 age group accounted for 43.47% of the cases, i.e. 24 patients, and the 16-24 age group for 54.6% of the cases, i.e. 30 patients. The average age was 17 years with extremes between 4 and 24 years.
- 5) The notion of tuberculosis infection was found in 12 patients, i.e. 22.64% of cases, and the notion of pulmonary or lymph node tuberculosis was found in 10 patients, i.e. 18.87% of cases.
- 6) The Fann University Hospital was the most consulted center for pot sickness with 47.17% of cases, followed by

the Idrissa Pouye Hospital (CTO) and the Thiès Regional Hospital, which each accounted for 20.75% of cases, and finally the Peace Hospital and the Ziguinchor Regional Hospital, which each accounted for 3.77% of cases;

3.2. Clinical Study

The average consultation time is 180 days or 6 months with extremes between 10 and 2190 days. Spinal pain was the most frequent reason for consultation in our setting, accounting for 30 cases (70%), followed by functional impotence of the limbs in 54% (28 patients). Finally, paraspinal swelling was found in 1 patient (3% of cases).

Alteration of the general condition of our patients represented 69% of the cases, fever was present in 9% of the cases and finally, and asthenia and dry cough were present in 2% of the cases each in our series.

3.2.1. Signs of the Physical Examination

Gibbosity was present in 35 patients or 66.04% of cases in our series.

3.2.2. Neurological Examination

Table 1. Distribution of patients according to Frankel's classification.

	Frankel	percent
A	16	30
B	4	8
C	7	13
D	7	13
E	19	36
TOTAL	53	100

Neurological disorders were observed in 64.15% or 34 patients (39.62% paraplegic and 24.53% paraparesis) and only 35.85% of patients were FRANKEL E. Sphincter disorders were also present in 36 patients or 67.92% of cases.

The multiple forms present in 3 patients or 5.77% of cases.

Sensory disturbances were present in 18 patients or 66.04% of cases in our series.

3.3. Paraclinical Study

The reference imaging examination in our setting was the spinal CT scan representing 98.28% of the cases, i.e. 52 patients, followed by the standard X-ray 80.79% of the cases, i.e. 43 patients, the MRI 28.35% of the cases, i.e. 15 patients and finally the EMG + abdominal ultrasound 1.89% of the cases, i.e. 1 patient.



Figure 1. CT scan of the dorsolumbar spine, axial and sagittal section of a child showing vertebral osteolysis of S1, T12 L1 and finally osteolysis of T6 - T7 with vertebral kyphosis.

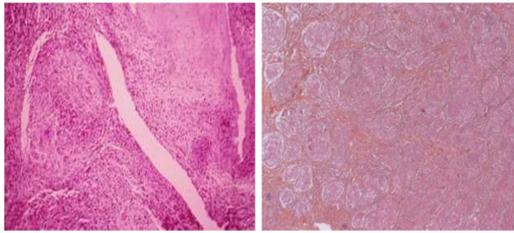


Figure 2. Microscopic appearance of tuberculoid granulomas.

- 1) Vertebral lesions were present in all our patients with extremes between 1 and 6 vertebrae. A predominance of 2 vertebrae involvement in 27 patients, i.e. 50.94% of cases, and involvement ≥ 3 vertebrae represented 17 patients, i.e. 32.13% of cases. Uni-vertebral involvement represented 16.98% of cases, i.e. 9 patients.
- 2) In this series, the dorsal segment represents 24 patients, i.e. 46.08%, followed by the lumbar spine 28.8% of cases (15 patients), the dorso lumbar hinge 17.28% of cases (9 patients) and finally the cervical segment and the cervico-dorsal hinge 2.84% of cases each (2 patients).
- 3) Vertebral osteolysis was predominant in 31 patients followed by vertebral compression in 27 patients, infectious epiduritis in 22 patients and vertebral kyphosis in 6 patients.
- 4) Paraspinal abscesses were present in 77.36% of cases, i.e. 41 patients.

3.4. Biological Tests

- 1) Gene Xpert was performed in 16 patients or 31.37% of cases and was positive in 9.80% of cases or 5 patients.
- 2) CRP was performed in 46 patients, i.e. a rate of 90.16% of cases, and was positive in 47.04% of cases, i.e. 24 patients
- 3) The sedimentation rate (SR) was not performed
- 4) Retroviral serology was negative in all our patients
- 5) The IDRT was performed in 6 patients, i.e. a rate of 12% of cases, and was positive in 8% of cases, i.e. 4 patients.
- 6) A complete blood count (CBC) was routinely performed in our setting, i.e. 100% of cases, and normocytic anemia was present in 6 patients, i.e. 12% of cases.
- 7) Only one patient had performed a bacteriological examination of the pus and no germs were isolated.
- 8) Anatomical examination was carried out in 100% of the cases operated on, i.e. 53 patients in the series, with a predominance of granulomatous inflammatory lesions

in 83.01% of cases, i.e. 44 patients, followed by caseo-follicular spondylitis in 13.07% of cases, i.e. 7 patients, and finally fibrous remodelling in 2 patients, i.e. 3.77% of cases.

Treatment

- 1) Object: To sterilize the focus, avoid neurological complications and improve patients' quality of life
- 2) Possibilities
 - A. Medical: All our patients had received anti-tuberculosis chemotherapy, i.e. 100% of cases for 12 months.
 - B. Physical: All our patients had received a rigid corset plus physiotherapy for rehabilitation and only 6% of the cases, i.e. 3 patients, had received only conservative treatment without surgery.
 - C. Chirurgical

Surgery for potted disease in children and adolescents in our setting accounted for 100% of the cases received.

General indications: persistence of neurological deficit under treatment, neurological deficit and signs of spinal instability.

GATTA classification: 62.26% of the cases in our series were classified as GATTA Type II, i.e. 33 patients, followed by Type Ib which represented 13.21% of the cases, i.e. 7 patients. Type Ia represented 7.55% of cases, i.e. 4 patients, and finally the unclassifiable represented 13.21% of cases, i.e. 7 patients in our series.

The posterior route predominated in our series with 92.45% of cases (49 patients) and the anterior route represented 7.54% of cases (4 patients).



Figure 3. Per operative image of a laminectomy + osteosynthesis by postero-medial approach.

Laminectomy + osteosynthesis represented 71.69% of the cases (n=38), simple laminectomy represented 20.75% of the cases (n=11 to patients), corporectomy + osteosynthesis represented 5.66% of the cases (3 patients) and finally flattening represented 1.88% of the cases (1 patient) in our series.

Surgical techniques according to the gatta classification

Table 2. Distribution of patients according to GATTA classification.

TYPE	FREQUENCY	TECHNICAL	PERCENT
Type Ia	4	Biopsy + medical treatment	7,54 %
Type Ib	7	Drainage of abscess +simple laminectomy	13,20 %
Type II	35	Laminectomy + anterior osteosynthesis	66,03 %
Type III	0	-	-
Inclassables	7	-	13,20 %
TOTAL	53		100 %

According to the GATTA classification, Type I represented 66.03% of the cases (n=38), Type Ib represented 13.20% of the cases (n=7), Type Ia represented 7.54% of the cases (n=4) and finally the unclassifiable represented 13.20% of the cases (n=7) in our series.

Surgical technique according to spinal level

Table 3. Distribution of patients according to the technique used for each vertebral level.

Spinal segment	Simple laminectomy	Laminectomy + osteosynthesis	Corpectomy + osteosynthesis	Flattening out	Approach
Cervical	-	1	1	-	1 anterior / 1 posterior
Cervico dorsal	-	1	-	-	
Dorsal	9	16	-	-	Posterior
Lumbar spine	1	7	-	-	Posterior
Sacral spine	2	14	-	-	Posterior
Total	12	39	1	1	

The dorsal segment predominated in pottic surgery (osteosynthesis + laminectomy in 16 patients or 30.18% of cases and simple laminectomy in 9 patients or 16.98% of cases) in our series.

3.5. Evolution

- 1) *The average hospitalisation time* was 9.6 days with a median of 7 days and extremes of 3 to 23 days of hospitalisation.
- 2) *Clinical:* All our patients had immediate postoperative monitoring and during consultations at the diagnostic centre by a complete clinical examination (neurological

and general) in order to detect immediate, short-term and long-term complications that may occur. Postoperative complications constituted 19% of cases in this surgery. Anemia in 4 cases (8%), dural breaches in 2 cases (4%), bedsores in 3 cases (6%), surgical wound infections in 2 cases (4%), fistulization of paraspinous abscesses in 1 case (2%) and hyponatremia in 1 case (2%).

Table 4. Distribution of patients according to the ASIA and Frankel postoperative classification.

	Frankel preoperative	Percent	Frankel postoperative	Percent
A	16	30	9	19
B	4	8	3	6
C	7	13	0	0
D	7	13	4	8
E	19	36	32	67
TOTAL	53	100	53	100

Motor recovery accounted for about 83% of the cases followed up over a period of 3 to 12 months in our series, i.e. 44 patients and 57% of Fränkel E. cases.

Radiology: Focused on immediate postoperative standard radiographs, which were requested in all patients who had undergone osteosynthesis, i.e. 56% of the cases in the study, before they were discharged from the department, followed by a CT scan of the spine at one month, 6 months and 12 months intervals to monitor the radiological consolidation of the pottic focus. It should be noted that MRI is a useful means of postoperative monitoring of patients, indicated in case of neurological worsening. No patient in this study had benefited from this examination as a means of monitoring.

Biological: During the follow-up consultations, a control inflammatory assessment consisting of a CBC, ESR or CRP was requested in almost all patients; and which showed biological normalisation after 3 months after the start of medical treatment in all patients. We asked for a control CBC to look for haematological side effects linked to antibacterials and to monitor the haemoglobin level after treatment, especially in patients. Postoperative anaemia accounted for 8% of these surgical complications, i.e. 4 patients.

4. Discussion

In children, tuberculosis often goes undetected because of the non-specific symptoms of the disease and the difficulties

associated with its diagnosis. It is therefore not easy to assess the true extent of the childhood tuberculosis epidemic, which may be larger than current estimates indicate [6]. It accounts for 14% of pottic disease surgery in Senegal.

The gender predominance of pott's disease varies between authors [7, 8, 22]. The average age varies in the paediatric and adolescent literature [8, 22, 23]. On average, 46% of tuberculosis patients are reported in the Dakar region alone, while 75% of cases are reported in the regions of Dakar, Thiès, Diourbel and Ziguinchor [3]. This is consistent with the epidemiological reality of the country. In most of the literature, the time taken to consult a doctor in our environments, for all ages, is generally long, between 6.6 and 9 months [16, 22]. The long delay in consultation could be explained by the use of traditional treatment in the first instance, the state of poverty of the patients [14]. The clinical manifestations vary according to the duration and severity of the symptoms, the location of the lesion and the presence of certain complications [20] and Mohammed Benzagmout et al also found spinal pain in 81% of cases [22]. Weidong Liang et al found 60% neurological involvement, i.e. 37 patients and 40% Fränkel E and no Fränkel A patients [8]; Kumar et al found between 10 and 47% of cases [6].

Cold pottic abscess is most commonly seen as part of the clinical manifestations of spinal tuberculosis [15, 18]. CRP is

a reference test in the diagnosis of pott's disease [2, 8, 11, 17]. The sedimentation rate has not been performed, unlike F Odey et al, which is 35% of cases [23]. HIV infection is one of the main risk factors for TB in Africa. HIV testing should be offered systematically in all cases of tuberculosis [1]. The IDRT is said to be positive if the diameter of the induration is ≥ 10 mm in children. In high-risk children (HIV, severe malnutrition, etc.) the test should be considered positive if the diameter is ≥ 5 mm [1]. The positivity rate of F. Odey et al is 50% of cases [23]. Pathological examination is the diagnostic examination for Pott's disease [1, 2, 3, 4, 5].

MRI is the imaging examination par excellence in the etiological search for Pott's disease, MRI has the best sensitivity with satisfactory specificity in spinal involvement, as T2 STIR sequences can detect inflammatory oedema early. In addition, MRI can visualise the extent of the abscess as well as spinal cord involvement [6, 8, 10, 11, 13, 19, 21, 22]. The socioeconomic level of our population plays a major role in access to quality diagnostic examinations. Vertebral lesions are variable depending on the duration of the infection and were present in all our patients with extremes between 1 and 6 vertebrae. Kumar et al also noted a predominance of the thoracic region in 28% of cases, the lumbar region in 9% of cases and the dorsolumbar hinge in 15.6% of cases [7]; Mohammed Benzagmout et al found a lumbar predominance in 23 cases [22].

There are few reports in the literature on the surgical treatment of spinal tuberculosis in young children [12]. Anatomical studies have demonstrated the feasibility of pedicle screw placement in small children and small 3.5 and 4.0 mm screws are available for the instrumentation of small pedicles [24]. In children, transpedicular instrumentation is the only way to achieve stable fixation. Using a posterior approach, there is no other chance to obtain a firm anchorage for correction and stabilization in a 1-2-year-old child. The smooth bone and structures do not allow for stable fixation of the posterior elements with hooks or wires. Furthermore, the connection between the posterior elements and the vertebral body via the neurocentral synchondrosis is not able to transmit adequate forces to the vertebral body. Thus, the only possibility of stable fixation is the insertion of transpedicular screws. These screws allow three-dimensional control of the vertebral body and the application of adequate correction forces and fixation.

Surgery is currently considered to be indicated for signs of the spinal cord or root compression; large abscesses; vertebral instability due to osteolysis and kyphosis; and failure of medical treatment [10, 22].

Sixty-three per cent of the cases in our series were classified as GATTA Type II, i.e. 38 patients, followed by Type Ib representing 13.20% of cases, i.e. 7 patients. Type Ia represented 7.54% of the cases, i.e. 4 patients, and finally the unclassifiable represented 13.20% of the cases, i.e. 7 patients in our series. Treatment with a corset is recommended by some authors in the literature, despite differences of opinion on this issue [11, 22].

Surgery still has its place in the management of pott's

aches in children and adolescents in our environment. The choice of technique used depends on the extent of the lesion, the degree of vertebral destruction, the kyphotic angle, the degree of spinal cord compression, the presence of paraspinal abscesses, and the general condition of the patient [8]. In our context, the choice of approach was also a function of the technical platform. Several approaches are recommended in the literature, including anterior, posterior, and anterolateral approaches [7, 9, 12].

In our series, 53 patients were operated on in our setting, i.e. a completion rate of 100% of cases. A clear predominance of the posterior approach with 92.45% of cases (49 patients) against 7.54% of cases for the anterior approach, i.e. 4 patients. Laminectomy + osteosynthesis represented 71.69% of cases, i.e. 38 patients, followed by simple laminectomy (20.75%, i.e. 11 patients), corporectomy + osteosynthesis (5.66%, i.e. 3 patients), and finally flattening (1.88%) in our series. In the series by Kumar et al, simple laminectomy represented 17.2% of cases [7].

Several complications have been noted in the literature, notably, those related to pedicle screws in children: dural breaches, malposition of the screw, and rupture of the medial wall of the pedicle, [24, 25]. Takahito Fujimori found a screw-related complication rate per patient of 2.1% and an overall screw-related complication rate of 0.14% [25].

5. Conclusion

The need for regular studies about Pott's disease remains one of the solutions for making an early diagnosis and keeping a functional prognosis for patients with Pott's disease. Surgical management of tuberculous spondylodiscitis in children and adolescents in Senegal is a rare entity and a little-used entity. The diagnosis is both clinical and paraclinical (CT and anapath), and the treatment is medico-surgical. The functional prognosis is generally favourable if the treatment is carried out earlier.

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